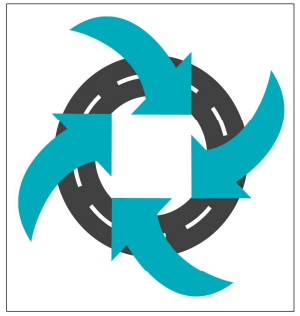
Comparison of the Financial, Social and Environmental Costs of Various Pavement Rehabilitation Design Solutions for Local Road Pavements using the Triple Bottom Line Concept



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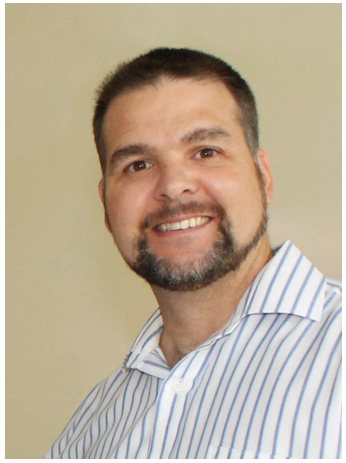

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Scope

- Local roads
- Triple bottom line
- Pavement rehabilitation options
- Costs
  - Financial
  - Environmental
  - Social
- Conclusion

Local Roads

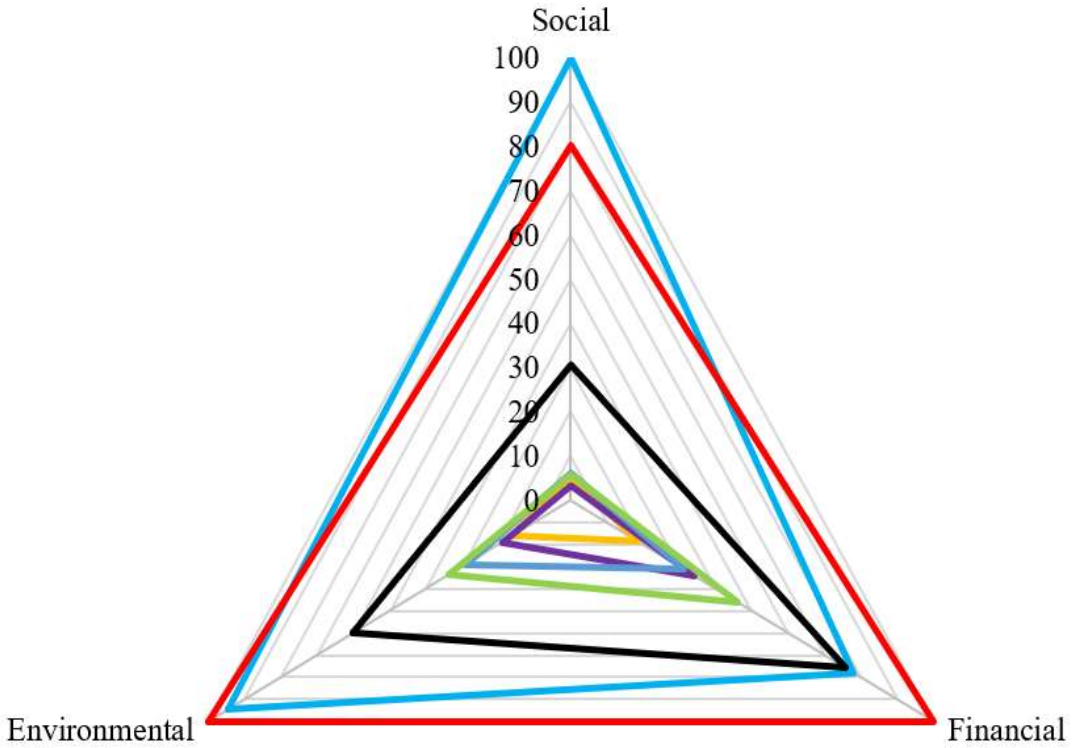
- Many kilometers paid by a modest population
- Cost efficiency in design and rehabilitation
  - Sprayed seal surfaces
  - Local or marginal gravel base materials
- 200-300 mm typical existing thickness
- Strengthening often required to restore

Triple Bottom Line

- Adapted from economic analysis
  - Financial cost
    - *Estimated construction cost*
  - Environmental cost
    - *Embodied carbon*
    - *Equivalent mass of CO_2 gas*
  - Social cost
    - *Road designs provide equivalent value*
    - *New quarry product and existing to landfill*

Triple Bottom Line

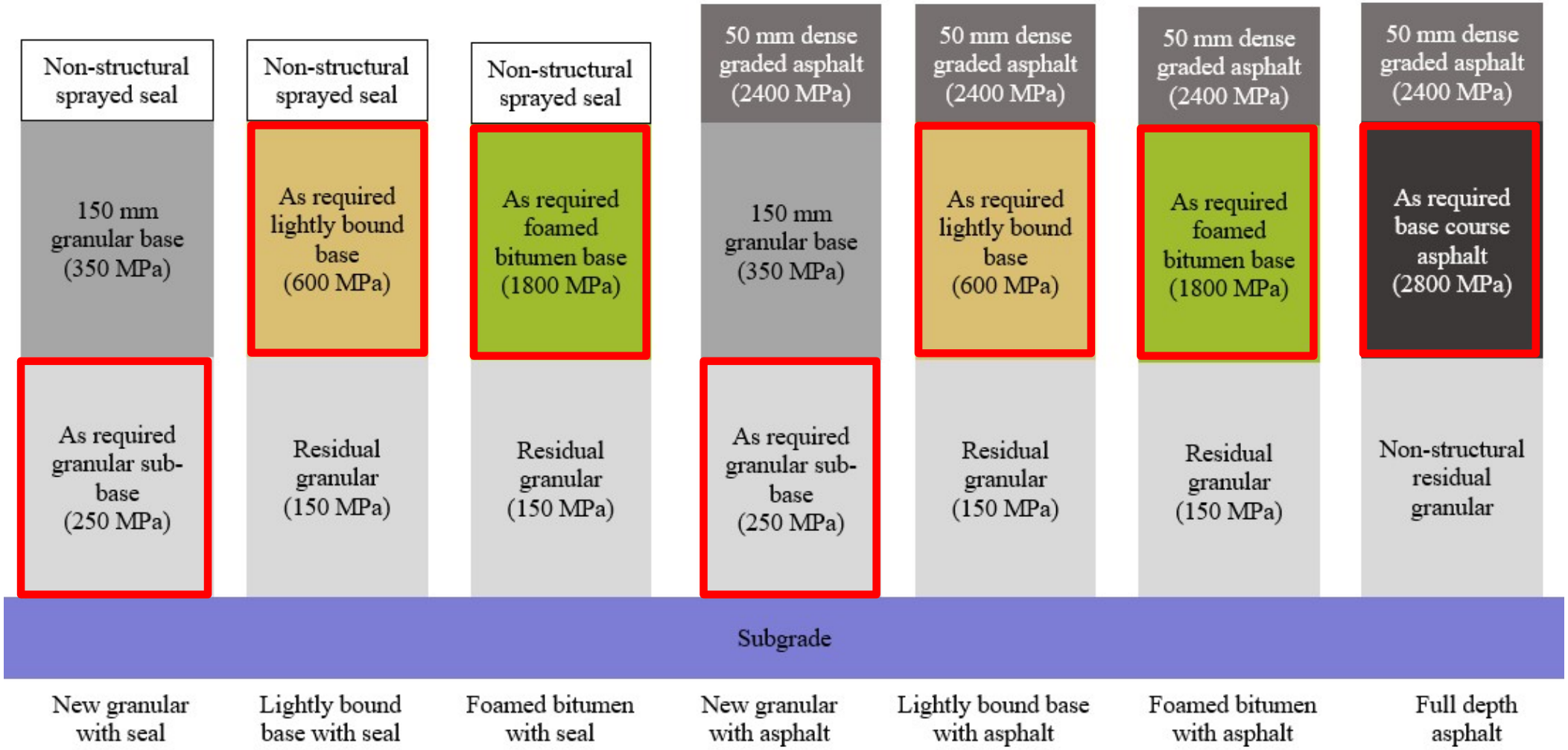
- Normalise costs
  - Neutralise different scales
  - Remove dimensions
- Combined to TBL
  - Area of radar graph
  - Visual comparison
- Normalise TBL to 0-100



Pavement Rehabilitation Options

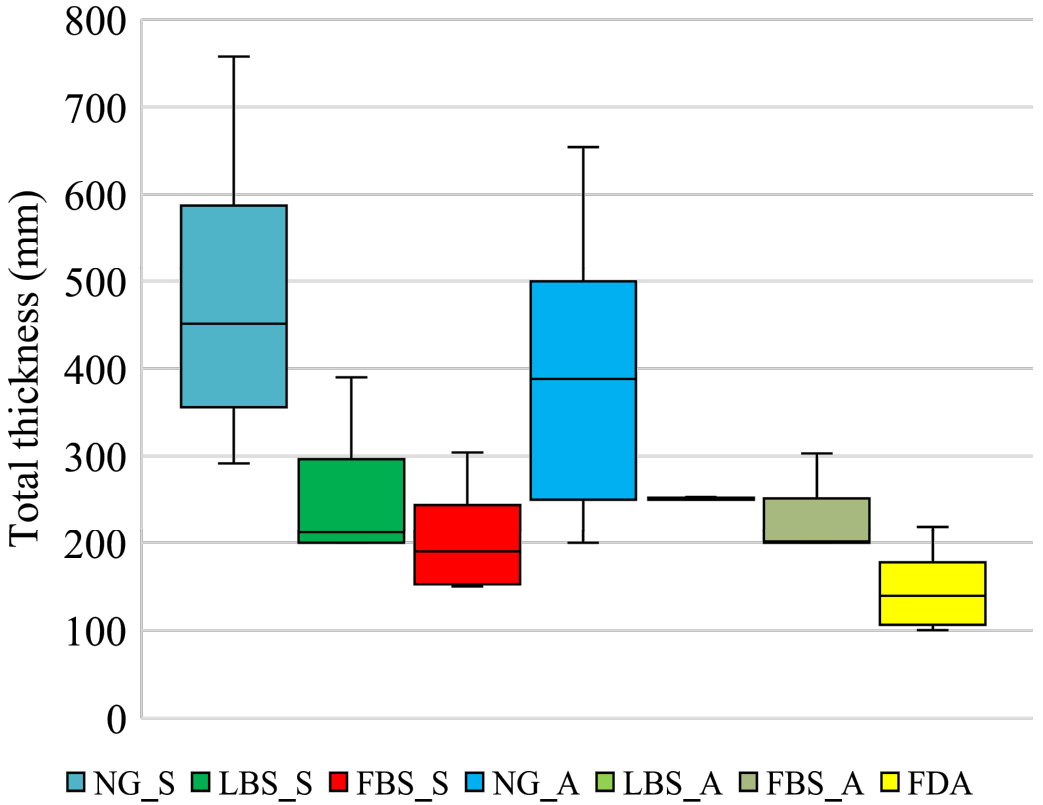
- Typical Australian pavement rehabilitation solutions
  - Thin asphalt and Sprayed seal surfacing
  - Stabilisation structural treatment options
  - New pavement constructions
- Three traffic levels (50,000, 500,000, 5,000,000)
- Four subgrade conditions (CBR 3, 5, 9, 15)
- 12 sets of 7 structurally equivalent design options
- Analysis limited to construction phase - conservative

7 Pavement Design Options

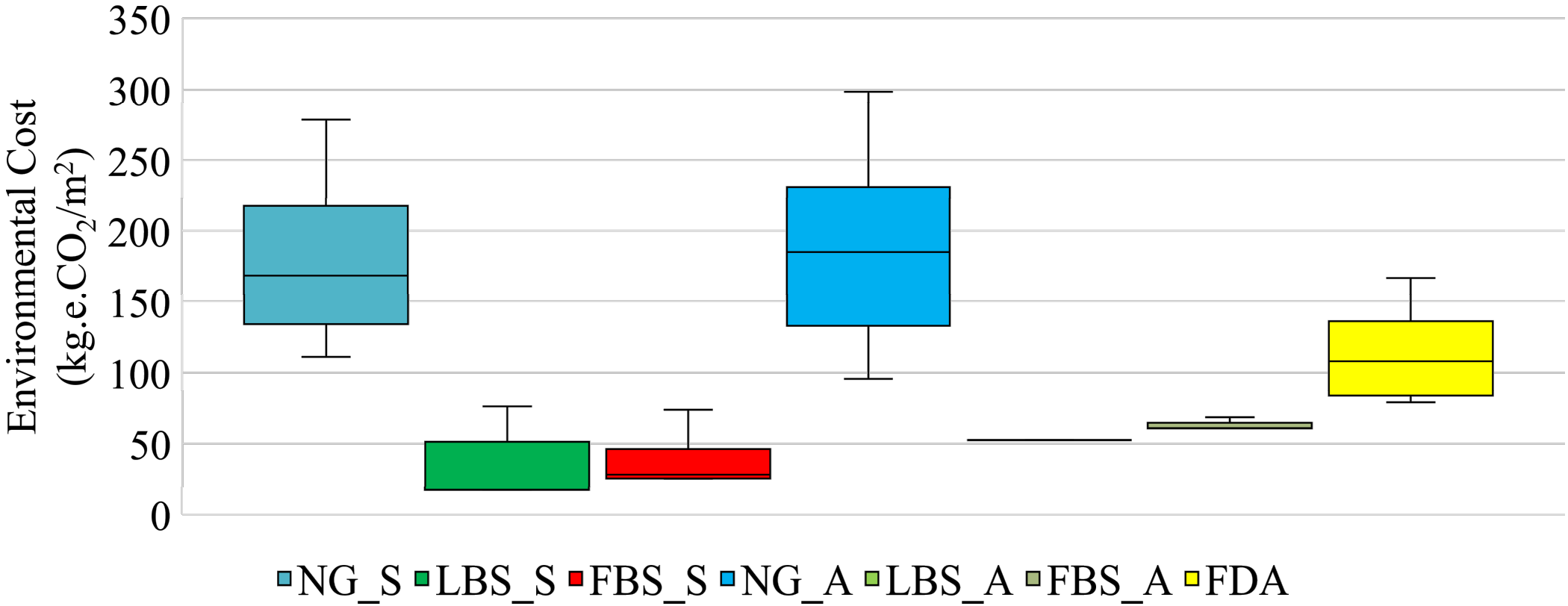


Pavement Thicknesses

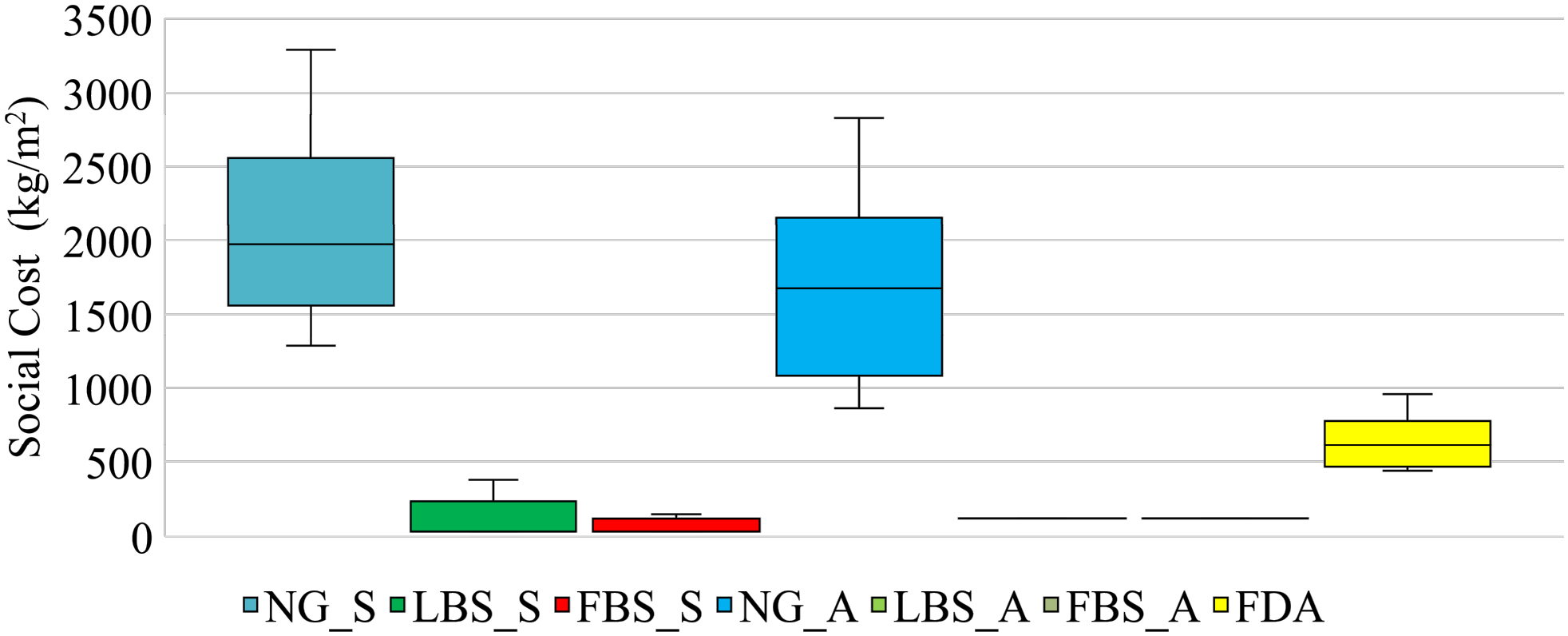
- NG – New Granular
- LBS – Lightly bound stabilised
- FBS – Foamed bitumen stabilised
- FDA – Full depth asphalt
- _S – Sprayed seal surface
- _A – Asphalt surface



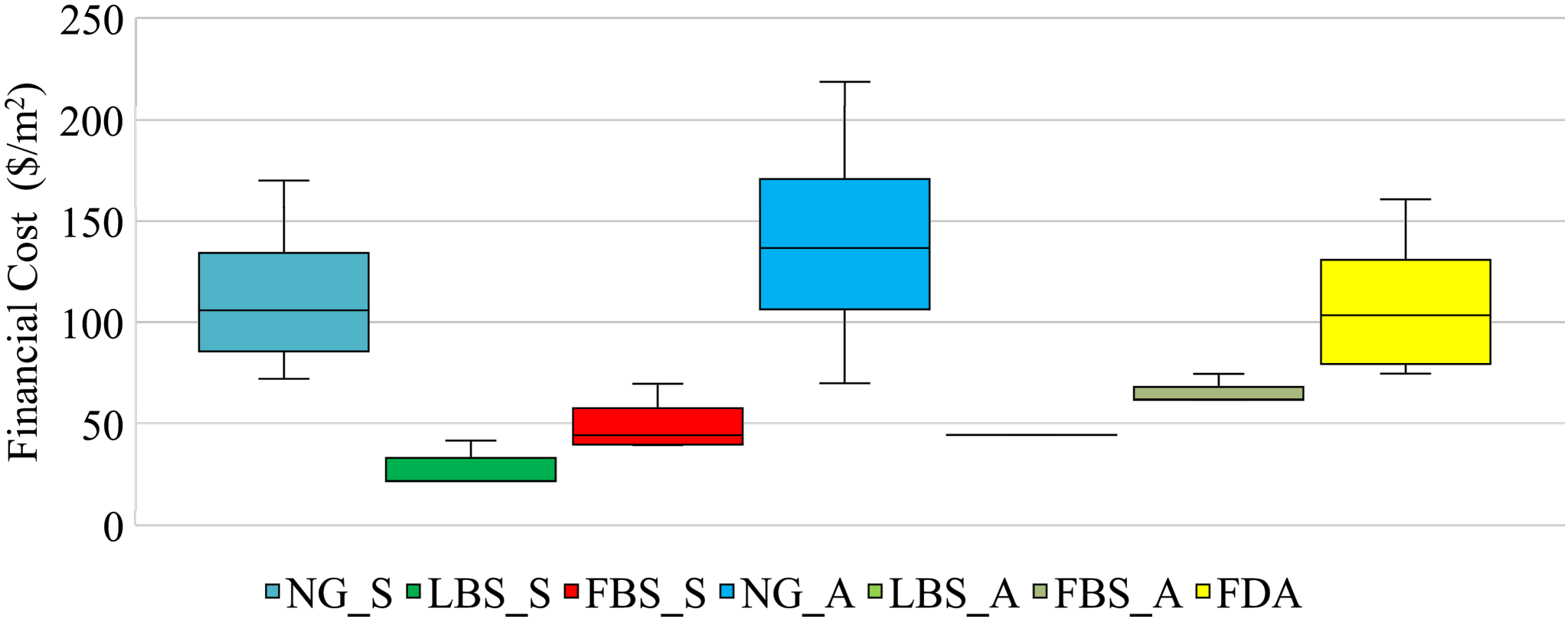
Environmental Costs



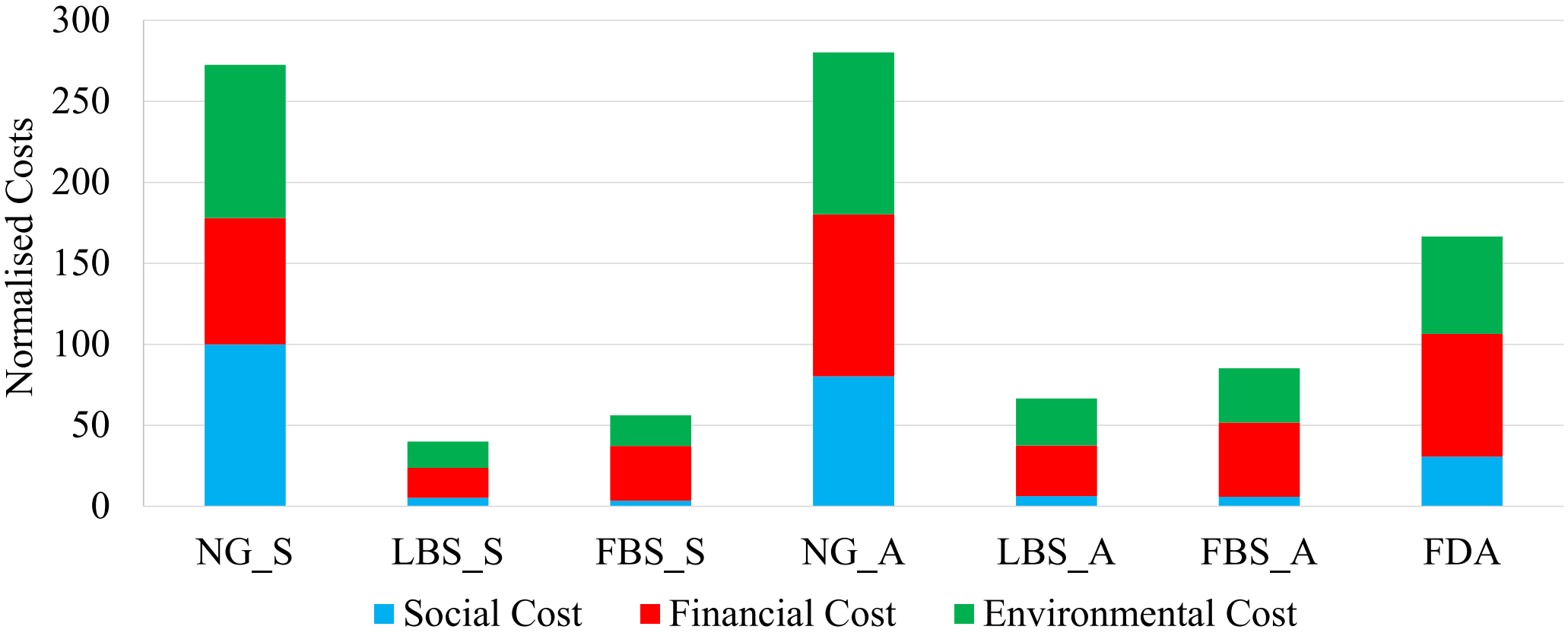
Social Costs



Financial Costs

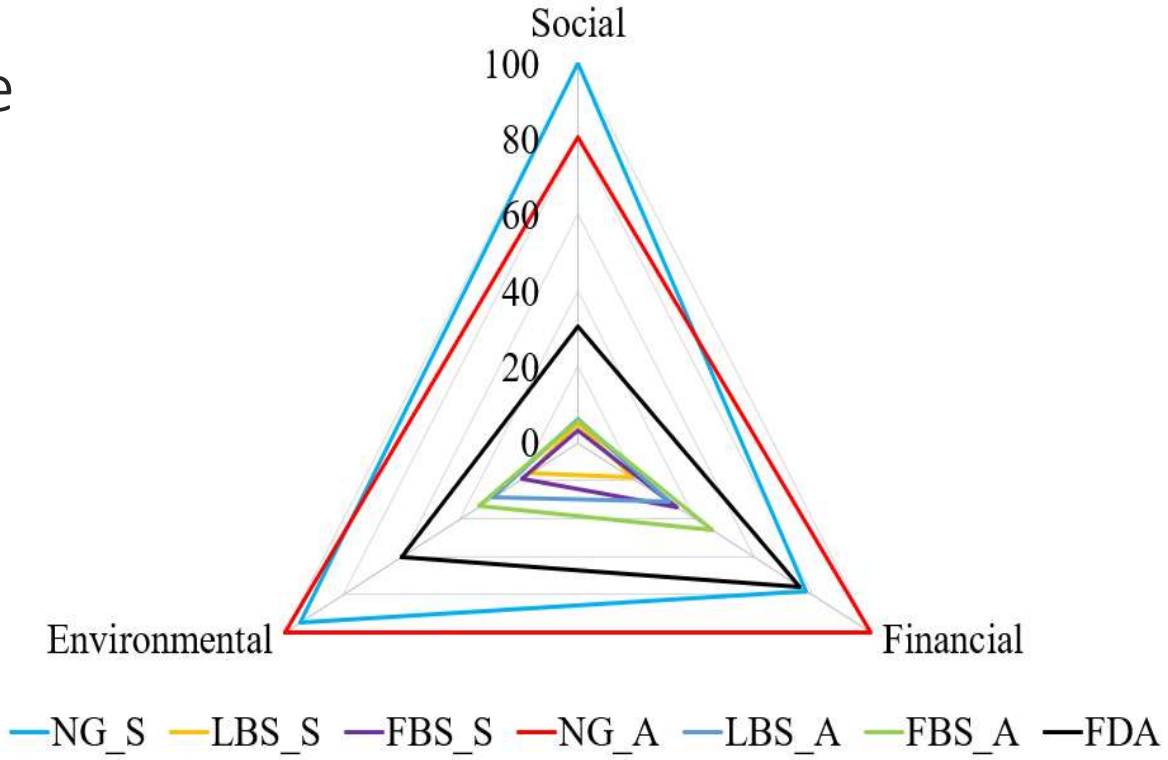


Average Triple Bottom Line



Average Triple Bottom Line

- New materials are expensive
  - Socially
  - Environmentally
  - Financially
- Stabilisation allows reuse
- Deep asphalt is in between



Conclusion

- TBL approach allows non-cost considerations
- Stabilisation options have the lowest TBL
  - Lightly bound cementitious stabilised base
  - Foamed bitumen stabilised base
- Sprayed seal surfacing has a lower TBL than asphalt

Existing Pavement Insitu Stabilisation should be the default option for low to medium volume local road rehabilitation, rather than being considered as an alternative

THANKS FOR YOU ATTENTION

Australian Pavement Recycling and Stabilisation Conference

Designing for Reuse and Resilience

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